



## DKG Health Services Research Notes II/2023

### Effects of Color Printing on the Response Rate of Postal-Written Surveys

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#### Summary

This research note investigates postal survey response rate differences with color versus black-and-white cover letters. We found a significant advantage for the black and white printed cover letters in terms of response rate after four weeks, but no significant difference for the secondary endpoint after five months.

#### Background

Everybody working in research knows the moment when you want to print, but the printer goes on strike because the ink cartridges are empty again. Even though many research methods are digital nowadays, the history of postal-written surveys dates to the end of the 19<sup>th</sup> century and is still relevant today (1). Discussions about the effects on response rates of postal questionnaires concern not only the content of the questions themselves but also the design of the layout. Considered influencing factors are, among many others, the handwritten signature of the researchers, the personalization of the cover letter, as well as the color scheme of the questionnaires (1,2). Studies recommend considering the design of postal surveys as one aspect of increasing response rates (3). For example, Dillman (2000) recommends that researchers sign the survey with a blue pen. Other studies showed no differences in this regard (2,4). The effect of colors on the human brain can be demonstrated in many facets in the literature (5) but in the context of research methodology, color as a design element has received little consideration. To take a closer look at possible effects in the research context, data from the CARES study (6) will be used here to observe the response rate of cover letters sent in black and white or in color. Can the results then be used for future studies? Is switching to many color cartridges necessary, or is just one black cartridge enough?

#### Aim of this research note

The research aim of the presented study is to identify whether the response rate of postal questionnaires depends on the color of the cover letter.

#### Methods

In the CARES feasibility study, cancer survivors were recruited via outpatient cancer counselling centers between April and August 2022 to complete survey questionnaires on routine counselling provision. Three months after the first questionnaire, which was handed out via the counseling centers, a follow-

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up questionnaire was sent out to all cancer survivors enrolled, including a personalized cover letter, the questionnaire, and a prepaid return envelope (6). Before sending out these second questionnaires, a randomization was performed in Excel, which assigned the study population into two groups, one receiving a colored cover letter and the other group receiving a black and white printed cover letter. The questionnaire itself was printed in black and white in both groups, and the cover letter was personalized for every study participant. To increase the response rate, a reminder, which was at the same time a thank-you-letter, was sent out to all patients after two weeks, also considering the color allocation performed previously. After another two weeks, a second reminder, including a new questionnaire, was sent out to those cancer survivors who did not respond within these four weeks, again considering the color group allocation. The primary endpoint was the response rate at 4 weeks, before every participant received the second reminder and questionnaire. The second endpoint was the response rate five months after the recruitment phase (January 2023), after all non-responders received the second reminder, including a new questionnaire and had a minimum of six weeks to return the questionnaire. No more questionnaires were counted after that. The Chi<sup>2</sup> test was used to detect differences in the response rate between the groups (significance level 0.05). The analysis of the response rate was carried out with R 4.3.1 using the 'R stats package' (7).

### Results

#### *Study cohort characteristics*

The study cohort comprised 290 participants, 22.4% male and 76.9% female. The mean age was 50 years. The mean time since cancer diagnosis was 1.9 years and most of the participants did not have metastases at enrollment (69.3%). The sample comprised survivors with various cancer diagnoses.

#### *Response rates and need for reminders*

Of the 290 questionnaires sent out, 134 were randomly assigned to the black and white cover letter group and 156 were assigned to the color group. 77.6% of the black and white group and 62.8 % of the color group sent their questionnaire back within four weeks (primary endpoint). The difference in the response rates between the black and white and the color group is statistically significant ( $\chi^2=6.78$ ,  $p<0.05$ ). At four weeks, in total, 88 reminders were sent out to non-responders. Five months after the end of the recruitment phase (secondary endpoint), the overall response rate was 90%; 124 questionnaires in the black and white group were returned (92.5%), and 137 (87.8%) in the color printed group. For the secondary endpoint, no significant differences in the response rate between both groups after reminding were observed (results not presented).



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Table 1: Response rate after four weeks

	Black and White print (n=134, %)	Color print (n=156, %)	$\chi^2$	p-value
Response four weeks after sending out the questionnaire	104 (77.6)	98 (62.8)	6.78	<0.05
No response four weeks after sending out the questionnaire (2 <sup>nd</sup> reminder necessary)	30 (22.4)	58 (37.2)		

### Discussion

The randomized sending of black-and-white or colored cover letters showed a higher response rate after four weeks in the black-and-white group. After sending out the second reminder questionnaire for non-responders, no difference was found. To our knowledge, no comparable study has examined the effect of printing colored cover letters on the response rate. However, an older study showed that using colored paper can influence the response rates on mail surveys in a positive way (8). In contrast, results of the present study showed no benefit in using colors for cover letters, leading to lower printing costs. Since almost everything in science is project-funded, proper use of resources is essential. It must be considered that for colored printing, four different cartridges are necessary, while for black and white printing, a black cartridge is enough, which is not only more sustainable but also cheaper than colored ones. Given that all cover letters were personalized, it would be interesting to examine the effect of the personalization of the cover letters for future research.

### Limitations

The recruitment of the study participants took place over five months, and the questionnaires were sent out three months after study inclusion. Thus, the participants received the questionnaire at different times of the year. Seasons and holidays might have impacted the response rate, shipping of the reminders and postal delivery. Furthermore, the receipt of the questionnaires was documented using the date of filling in the questionnaire that participants indicated in the beginning of the questionnaire. This could have led to some bias in the second reminder group since some participants sent the questionnaire to the office weeks after they filled it in. Randomization should, in principle, balance such



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differences between the groups. However, with the relatively small sample size, it is possible that this is not true for all the potential biases mentioned.

### Conclusion

Researchers should use black and white instead of color cover letters. We are all relieved that in the future we will only have to deal with replacing one printer cartridge at a time and that we don't have to focus on thinking about how to design the colored questionnaires.

### References

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